CLAIMS

We claim:

1. A structure for the construction of one of a microscale and nanoscale device, comprising:

a rigid frame supporting a tensile diaphragm, the diaphragm having

a first region comprising material having a net compressive strain energy, said region having a first thickness and a first lateral extent, and

a second region laterally adjacent to the first region, the second region comprising material having a net tensile strain energy,

wherein the net strain energies of the first region plus the second region are tensile, and

wherein the first lateral extent of the first region in relation to the first thickness is sufficiently small to avoid buckling or wrinkling of the first region.

2. A structure as recited in claim 1, wherein the nanoscale device is a nanopore.

3. A structure as recited in claim 1, wherein the first region comprises a layer of silicon dioxide.

4. A structure as recited in claim 1, wherein the second region comprises a composite set of layers.

5. A structure as recited in claim 4, wherein one of the composite set of layers comprises a layer of silicon nitride.

6. A structure as recited in claim 5, wherein the silicon nitride layer is from 50 nm to 500 nm in thickness.

7. A structure as recited in claim 5, wherein the silicon nitride layer is about 200 nm thick.

8. A structure as recited in claim 4, wherein one of the composite set of layers comprises a layer of silicon dioxide.

9. A structure as recited in claim 8, wherein the silicon dioxide layer is from 50 to 600 nm in thickness.

10. A structure as recited in claim 1, wherein the first region is from 50 to 600 nm in thickness.

11. A structure as recited in claim 1, wherein the first region is about 500 nm thick.

12. A structure as recited in claim 1, wherein the tensile diaphragm has a width to thickness ratio from about 4 to about 1000.

13. A structure as recited in claim 1, wherein the width of the tensile diaphragm is about 40 micrometers.

14. A structure as recited in claim 1, wherein the first region has a width to thickness ratio from about 4 to about 60.

15. A structure as recited in claim 1, wherein the first region has a width of about 5 micrometers.

16. A method of making a composite tensile diaphragm, comprising:

(a) providing a rigid frame supporting a composite tensile diaphragm comprising a tensile layer and a compressive layer;

(b) defining a region to be etched in the tensile layer; and

(c) etching a region in the tensile layer to expose the compressive layer.

17. A method as recited in claim 10, wherein the tensile layer comprises silicon nitride.

18. A method as recited in claim 10, wherein the compressive layer comprises silicon dioxide.

19. A method as recited in claim 10, wherein photolithography is used to define the region to be etched.

20. A method as recited in claim 10, wherein plasma etching is used to etch the region in the tensile layer.